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filtered out and could not be a chemical ferment, for it is opposed to all known peculiarities of enzymes to be filtered out of solutions. The common method for the concentration of an enzyme, i. e., precipitation with not too strong alcohol from the crude juice and re-solution in water, was tried. This led to no substance which had infective power.

Inoculations with heated sap led to the following results: Persistent warming at 60° did not perceptibly alter the infectious power; at 65° to 75° it was weakened. Heating the sap at 80° for several hours killed the infective power. These experiments show that the infective substance satisfies the requirements of an organized ferment, and indicate that the infective body must be searched for among the small organized bodies. Fungi are much too large to pass through filter paper, and if the disease was due to these it would seem that they must assume at some stage some more easily visible form.

The following is a rather literal rendering of the author's conclusions:

(1) The "mosaic disease" of tobacco is a bacterial disease, the infective organism of which has not yet been isolated so as to know its form and mode of life.

(2) The infective power of the disease from plant to plant under the artificial conditions of sap mixture has been established with certainty. Under natural conditions there is no plain infection from plant to plant. The seeds of diseased plants can produce sound plants.

(3) The cause of the disease must be sought in the earth of the tobacco fields and the hotbeds, for particular fields, especially those in which tobacco follows tobacco, are most exposed to the disease. A case of transportation of the disease with earth, however, was not established.

Rotation of crops is advised, also the removal of the diseased plants, and after harvest all remnants of the crop.—ERWIN F. SMITH.

MOELLER, H.—*Entgegnung gegen Frank, betreffend den angeblichen Dimorphismus der Wurzelknöllchen der Erbse*. <Ber. d. Deut. Bot. Ges., Bd. x, Nov. 24, 1892, pp. 568-570.

In a recently published note upon root tubercles, Frank states that those of the pea show two forms that differ externally, but have the same internal structure, and furthermore that the content is different, being albumen bacteroids in the one, and amyloextrin bacteroids in the other.

The author of this paper proved some time ago that these tubercles do not contain amyloextrin, but a waxy substance, and this fact made him doubt the correctness of Frank's observations. He has also studied the exterior form of such tubercles and states that vigorous specimens of pea show a considerable variety of such tubercles, but without any distinction of two special forms. An examination of their contents gave only albumen bacteroids. These investigations were

made when the plants were at the end of their vegetative period, while those of Frank were made shortly before their flowering, a fact that might have led to the difference in results.

In *Trifolium* the tubercles are developed all the year round without being dependent upon the growth of the plant. It would appear that the biological process in these tubercles consists in the bacteria becoming transformed into bacteroids by a certain kind of hypertrophy, and that when dead the organisms are resolved into a fatty substance. The author is unable to believe in anything like a reabsorption of the bacteroids. The result of his examinations shows that the tubercles are not to be differentiated, either in their shape or in regard to their contents; thus no dimorphism is observable.—THEO. HOLM.

Report on recent experiments in checking potato disease in the United Kingdom and abroad. London, 1892, pp. 193, figs. 5.

Notwithstanding the fact that the potato is the standard crop, constituting the larger part of the food of the people of Ireland, and is an important product of England and Scotland; that the vegetable is known to have been affected by fungi since 1844; that the disease has in some years been so severe as to cause tremendous losses and even a famine in Ireland; and that for the past six years the disease has been known to be successfully combated by copper compounds, still the authorities of Great Britain do not seem to have made any attempt to prevent the disease by treatment with these compounds until 1891. It is true that when the results of experiments made in France in 1838 became known, the attention of the Government was called to them, but without any result, save the issuance of a report or two. In 1891 the Royal Agricultural Society of England began to make some experiments. The board of agriculture also began to bestir itself and to inquire of foreign consuls what progress had been made in checking the disease. The results of the experiments and inquiries are embodied in the report at present under notice, and which was issued by the board of agriculture in the spring of 1892.

The report is divided into four parts: Part 1, contributed by Charles Whitehead, consists of a history of the disease; its cause; the life history of the fungus; and the action of "bouillie bordelaise," or Bordeaux mixture, as it is commonly called. From this introduction it appears that although in 1846 Berkeley had shown the disease to be caused by a fungus, agriculturists generally up to as late a date as 1872 believed the fungus to be the effect rather than the cause. This is shown by the fact that out of ninety-four essays submitted as the result of an offer of £100 for the best account of the trouble and its remedies, not one was deemed worthy of the prize, and not one contained correct ideas as to its origin. This is certainly remarkable when we remember the number of able botanists which England possesses and the demonstration by Berkeley twenty-five years before. The idea also at one time pre-